CINCAD SPACE SHUTTLE SUPPORT (STS-2)

IMPLEMENTATION PLAN 3410-81

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Approval:

Thomas C. Brandt

Thomas C. Brandt, Brig. Gen., USAF
Assistant DCS/Operations for Combat Operations
HQ ADCOM

Space Operations Directorate
Cheyenne Mountain Complex, CO

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TABLE OF CONTENTS

		Page
Section I	- Operational Concept	1
Section II	- Acronym Listing	2
Section III	- Execution Checklist	5
	A. Pre-Launch	5
	B. Launch	9
	C. On-Orbit	11
	D. Deorbit/Landing	14
Section IV	- Responsibilities	16
	A. J-3V	16
	B. J-3T	16
	C. J-3YY	16
	D. SOO	17
	E. SPC	17
	F. SST	17
	G. LCUDO	17
	H. MCO	18
	I. OAL	18
	J. ASCC/SCF	19
Section V	- Contingency Checklists	20
	A. Pre-Launch	20
	B. Launch	21
	C. On-Orbit	24
	D. Deorbit/Landing	34
	E. Other	37
Appendix 1	- OFT-1 Ground Traces	40
Appendix 2	- Special Support Criteria	44
	A. CONSO	45
	B. Conferences	46
	C. TIP	47
Appendix 3	- Agency/Personnel Directory	48
	A. Telephone Numbers	49
	B. Message Addresses	49
Appendix 4	- Distribution	50

SECTION I - OPERATIONAL CONCEPT

This Implementation Plan is published in accordance with CINCAD OPLAN 3418-81. This plan shall be in effect throughout the life of all Space Shuttle missions. The plan is unclassified; however, its contents shall not be disclosed outside official channels without approval from the Director of Space Operations, Cheyenne Mountain Complex, CO.

Specific duties, responsibilities, actions, and interfaces are identified, and are effective upon receipt of this document.

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The guidance and directives contained in this plan will be used by the individuals directly involved in providing ADCOM support to the Space Shuttle. Changes shall be provided/approved by the Director of Space Operations through the issuance of Fragmentation Orders.

Refer any comments/questions on this plan to the Director of Space Operations, AJ-3T, Cheyenne Mountain Complex, CO 80914. AUTOVON 834-1211, Ext. 3884, or Commercial (303) 473-4010, Ext. 3884.

SECTION II - ACRONYM LISTING

ADCOM	Aerospace Defense Command
ATA	Abort Once Around
ATS	Advanced Range Instrumentation Ship
ASC	Ascension
ASCC	Alternate Space Computation Center (Eglin AFB, Fla.)
ATO	Abort to Orbit
BCF	Backup Computational Facility (NAVSPASUR, Dahlgren, Va)
CD	Command Director
CLS	Contingency Landing Site
COMBO	Computation of Miss Between Orbits (SCC program)
D/O	Deorbit
EAFB	Edwards Air Force Base
EGL	Eglin AFB, Fla.
EODET	Early Orbit Determination
ET	External Tank
FD	Flight Director (JSC)
FDO	Flight Dynamics Officer (JSC)
FTC	Flight Termination Conference
ILAM	Initial Launch Alert Message
IOMODX	SCC program for generating Initial Orbits via vectors
JSC	Johnson Space Center

J-3Y	Space Operations Directorate (NCMC)
J-3T	Directorate of Training and Exercise (NCMC)
J-3V	Directorate of Standardization/Evaluation (NCMC)
J-3YY	Space Analysis and Data Division (NCMC)
KSC	Kennedy Space Center
L&I	Launch and Impact
LCHE	Launch Event Record
LCU	Launch Correlation Unit (NCMC)
LCUDO	Launch Correlation Unit Duty Officer (NCMC)
MECO	Main Engine Cut-Off
MOCR	Mission Operations Control Room (JSC)
MW	Missile Warning
MWO	Missile Warning Officer (NCMC)
NASA	National Aeronautics and Space Administration
NAVSPASUR	Naval Space Surveillance System (Dahlgren, VA)
NCMC	NORAD Cheyenne Mountain Complex
NFL	New Foreign Launch
OAL	Orbital Analyst Leader (NCMC)
OFT	Orbital Flight Test
OMS	Orbital Maneuvering Subsystem
OPREP	Operations Report
OV	Orbiter Vehicle
PASCHED	Pass Schedule (SCC program)
PPLF	Pre-Planned Launch Folder

PPE	Pave Paws East
PPW	Pave Paws West
PREDICT INPACT	SCC program used to predict impact points for decaying satellites
RCO	Range Control Officer (KSC)
RTLS	Return to Launch Site
SCC	SPADOC Computation Center (NCMC)
SDA	Space Defense Analyst (NCMC)
SDD	Space Defense Director (NCMC)
SEWS	Satellite Early Warning System
SPADOC	Space Defense Operations Center (NCMC)
SRB	Solid Rocket Boosters
SSC	Space Surveillance Controller (NCMC)
SST	Space Surveillance Technician (NCMC)
TEARR	Time, Elevation, Azimuth, Range, and Range Rate
TIP	Tracking and Impact Prediction

SECTION III - EXECUTION CHECKLIST

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Timing[1]	Action/Event	Headquarters/ Agency

A. PRE-LAUNCH:

b5

Timing	Action/Event	Headquarters/ Agency

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Timing	Action/Event	Headquarters/ Agency

Timing	Action/Event	Headquarters/ Agency

b5

Timing	Action/Event	Headquarters/ Agency

b5

B. LAUNCH:

b5

Timing	Action/Event	Headquarters/ Agency

65

Timing	Action/Event	Headquarters/ Agency

65

C. ON-ORBIT:

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Timing	Action/Event	Headquarters/ Agency

b5

Timing	Action/Event	Headquarters/ Agency

b5

Timing	Action/Event	Headquarters/ Agency

b5

D. DEORBIT/LANDING:

b5

Timing	Action/Event	Headquarters/ Agency

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SECTION IV - RESPONSIBILITIES

The following agencies are tasked to ensure CINCAD OPLAN 3410-81 support is consistent for all OFT flights:

A. J-3V: The Space and Missile Warning Standardization/Evaluation Directorate have certified that all SCC operational crews are operationally ready prior to OFT-1.

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B. J-3T: The Training Directorate is responsible for exercising crews on a regular basis, ensuring crews are trained with up-to-date information on OFT flight profiles and capabilities, and ensuring currency in the crews' ability to support each OFT flight.

C. J-3YY: The Space Analysis and Data Division is responsible for meeting the requirements of the Pre-Planned Launch Processing OI. Further, they are responsible for assisting J-3T in crew exercises when necessary, disseminating information from NASA to ADCOM personnel, and for augmenting the SCC operational crews for OFT activities when necessary.

D. SDD: The Space Defense Director is responsible for providing space defense warning if the OV is subjected to potential threats.

E. SSC: The Space Surveillance Controller is responsible for assuring ADCOM support requirements are met, and maintaining the interface between the SCC and the JSC Mission Operations Control Room (MOCR).

F. SST: The Space Surveillance Technician is responsible for sending the alert and liftoff messages to appropriate sensors and assisting the SSC in monitoring SCC activity and support during the STS flight. The Space Surveillance Technician is also responsible for determining sensor status and establishing and maintaining communications with necessary agencies.

G. LCUDO:

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H. [redacted]: The Missile Warning Officer is responsible for

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I. [redacted]: The Orbital Analyst Leader is responsible for OFT flight profile familiarization, providing the analytical support for JSC, and assisting the SSC in monitoring support requirements.

J. ASCC/BCF: The ASCC and the BCF will operate in parallel with the SCC

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These two agencies will develop in-house procedures to ensure compliance. The SCC will relay pertinent events, information, and appropriate state vectors to the ASCC and BCF. TIP and COMSO products will be transmitted to the SCC only.

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SECTION V - CONTINGENCY CHECKLISTS

With the exception of COMBO and External Tank TIP support, contingency support has not been requested by NASA. However, the following contingencies have been preplanned by ADCOM in the event additional support is requested on very short notice.

Computation of Miss Between Orbits (COMBO)
Anomalous Liftoff
MECO Overburn/Overspeed
Anomalous OMS Burns
"Events" during OV flight
Anomalous Reentry of OV
JSC/MOCR Outage
Radar Tracking Restriction

A. PRE-LAUNCH:

COMBO:

Should a launch hold occur late in the countdown, a re-run of COMBO 2 will be required for the new liftoff time.

ADCOM COMBO support will provide JSC with valid conjunction information throughout the mission profile.

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The SSC may obtain new state vectors from JSC/FDO whenever the SCC maintained element set is in question. The SSC will direct the CAL to rerun any COMBO of questionable validity or to run a new COMBO if the SSC or CAL think it warranted. The SSC will pass any new results to JSC/

B. LAUNCH:

Anomalous Liftoff:

An anomalous liftoff could result in a Return-to-Launch-Site (RTLS), or a splashdown in the Atlantic Ocean.

SUPPORT: Because the RTLS and splashdown contingencies occur very early in the mission profile (after SRB staging), ADCOM support will be minimal. The SSC will insure that the ASCC/SCF are immediately advised of any contingency condition. The Initial Launch Alert Message will contain specific tasking instructions to cover these contingencies.

CHECKLIST:

RTLS or Splashdown:

1.

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External Tank Overspeed:

Any External Tank Overspeed caused by a MECO overburn is a condition that has received a great deal of consideration by both NASA and ADCOM. MECO and ET separation constitute a critical phase in the flight profile.

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Speculation exists as to how much time past the nominal burn would be required to move the ET impact past the Indian Ocean and nearer to the western CONUS. An overburn of one second is generally thought to be this minimum time required. This short overburn becomes even more important when coupled with the reasonably high possibility that the condition may occur during the actual flight. This anomalous separation could cause the ET to attain a much higher ballistic trajectory or even a fractional/multiple orbit which could result in an elongated footprint and a

b5

The same contingency could result from an overspeed condition if, upon separation, the ET is imparted a greater velocity than planned. Even a nominal separation may put the ET impact in an area other than the projected Indian Ocean footprint.

SUPPORT: Because of the possibility of an anomalous ET reentry, b5

If the ET should extend ballistic flight and approach the CONUS, the MWO will forewarn the NM network as to the nature of the reentry. Appropriate sensors will track the ET and generate L&Is. b5

CHECKLIST:

EXTENDED BALLISTIC TRAJECTORY:

1. b5

2. b5

Should the ET attain a fractional or multiple orbit, all acquiring sensors will send their data FLASH precedence to the SCC. The CAL will then run PREDICT IMPACT.

b5

FRACTIONAL OR MULTIPLE ORBIT:

1. b5

2. b5

3. b5

C. ON-ORBIT:

Anomalous OMS Burns:

Orbital Maneuvering Subsystem (OMS) burns occur at four separate phases of the mission profile. A bad burn at any one of these phases could affect the rest of the mission profile from that point. Therefore, each burn must be monitored by the SSC and tracking data obtained during, or as soon as possible after, the burn. The actions for any anomalous OMS burn follow:

Anomalous OMS-1:

A bad OMS-1 burn could result in an Abort-Once-Around (AOA) or an Abort-To-Orbit (ATO).

SUPPORT: Since OMS-1 occurs during the earliest part of the flight, b5

The JSC/FDO will pass the abort determination to the SSC as well as the choice of primary landing site. The SSC will then determine what sensors will cover the abort.

CHECKLIST:

Abort-Once-Around (AOA):

1. ------ b5

2. b5

3. b5

b5

Should NASA press for an OMS-2 burn after a bad OMS-1 (ATO), the JSC/FDO will pass the new proposed OMS-2 vector to the SSC. The OAL will re-run COMBO for the planned OMS-2 nominal and the SSC will pass the new conjunction results to the JSC/FDO. The SST will then run a new PASCHED. The

SSC will voice-task sensors and request the data be sent FLASH precedence (or equivalent) to the SCC, ASCC and SCP. ADCOM support then resumes at the normal CMS-2 point.

CHECKLIST:

Abort-To Orbit (ATO):

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

7. b5

Anomalous CMS-2:

b5

SUPPORT: Should the OV have no OMS-2 burn, JSC/FDO will pass an early deorbit time and landing site to the SSC as soon as JSC makes the decision. The SSC will determine acquiring sensors and have track data sent to the SCC, ASCC, and BCP, Flash precedence (or equivalent).

CHECKLIST:

OMS-2 No Burn:

1. b5

2. b5

Should the OV have an incomplete OMS-2 burn, the JSC/FDO will pass the SSC a new state vector and injection time. The OAL will enter the new vector into the system and re-run COMBO. The OAL will run a new PASCHED. The JSC/FDO will inform the SSC if the OV will deorbit at a later time or attempt to reach the OMS-2 orbit with a successive burn.

CHECKLIST:

OMS-2 Incomplete Burn:

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

7. b5

8. b5

Anomalous OMS-3:

b5

SUPPORT: Should the OV have no OMS-3 burn, there should be no other requirement than to run COMBO for the extended OMS-2 orbit. The SSC will ask the JSC/FDO if there will be another OMS-3 attempt or an early deorbit.

CHECKLIST:

OMS-3 No-Burn:

1. b5

2a. b5

2b. b5

2c. b5

2d. b5

3a. b5

3b. b5

3c. b5

3d. b5

3e. b5

3f. b5

4. b5

Should the OV have an incomplete OMS-3 burn, the JSC/FDO will pass the new OMS-4 vector to the SSC. The OAL will enter the vector into the system via ICMODX and re-run COMBO. The OAL will run a new PASCHED. The SSC will pass any new conjunction results to the JSC/FDO. ADCOM support then resumes at the OMS-3 point.

OMS-3 Incomplete Burn:

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

Anomalous OMS-4:

b5

SUPPORT: The SSC will find out if the OV is going to deorbit early from the JSC/FDO. If so, the JSC/FDO will pass a new vector, landing site and deorbit time to the SSC. The CAL will enter the new vector into the system and re-run COMBO. The CAL will run a new PASCHED. The SSC will begin flight termination actions when appropriate.

If the OV is going to power-down and reentor later than planned (i.e. past rev 84), the CAL will run COMBO for the extended OMS-4 orbit and the new deorbit vector once acquired from the JSC/FDO. The SSC will begin the flight termination procedures when appropriate.

CHECKLIST:

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

7. b5

8. b5

"Events" during OV flight:

Events include launch of non-allied boosters and maneuvers of non-allied payloads, or any other potential threat action.

SUPPORT: Any event while the OV is in orbit will be analyzed to determine if the event poses a threat to the OV. The OAL will run COMBO between appropriate orbits to aid in making this determination. The SDD must interact according to established SPADOC procedures. Any potential threat will be passed to JSC immediately to allow time to maneuver the OV and avoid the potential threat if deemed necessary.

CHECKLIST:

1. b5
2. b5
3. b5
4. b5
5. b5
6. b5
7. b5

8. b5

9. b5

10. b5

D. DEORBIT/LANDING:

Anomalous Deorbit:

A bad deorbit (D/O) burn could affect the reentry of the OV or extend the mission length.

SUPPORT: Should there be no deorbit burn, the OV will remain in the OMS-4 orbit. The SSC will find out from the JSC/FDO if and when the OV will again attempt to deorbit. JSC may elect to power-down the OV and wait 24 hours or longer for another optimun deorbit opportunity. In this case the A/SSC will pass this information to the ASCC and the BCF, the OAL will run a 30-hour COMBO and the SSC will pass new conjunction results to the JSC/FDO. The OAL will run a new PASCHED for the same time to determine who will track the OV and assure it is well tracked while awaiting the second deorbit attempt. All actions must be accomplished for all missed deorbit attempts.

8. b5

9. b5

10. b5

D. DEORBIT/LANDING:

Anomalous Deorbit:

A bad deorbit (D/O) burn could affect the reentry of the OV or extend the mission length.

SUPPORT: Should there be no deorbit burn, the OV will remain in the OMS-4 orbit. The SSC will find out from the JSC/FDO if and when the OV will again attempt to deorbit. JSC may elect to power-down the OV and wait 24 hours or longer for another optimum deorbit opportunity. In this case the A/SSC will pass this information to the ASCC and the BCF, the OAL will run a 30-hour COMBO and the SSC will pass new conjunction results to the JSC/FDO. The OAL will run a new PASCHED for the same time to determine who will track the OV and assure it is well tracked while awaiting the second deorbit attempt. All actions must be accomplished for all missed deorbit attempts.

CHECKLIST:

D/O No-Burn:

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

Should there be an incomplete D/O burn, the OV may re-enter on a shallower trajectory. This may require the SSC to pass any acquisition data to the JSC/FDO so the JSC/FDO can begin arrangements for a possible CLS landing. Furthermore, the MWO may need to alert MW units of the nature of the OV reentry in case of L&I generation.

D/O Incomplete Burn:

1. b5

2. b5

3. b5

4. b5

5. b5

6. b5

Anomalous Reentry of OV:

An anomalous reentry of the OV could result in a breakup in the Earth's atmosphere.

SUPPORT: Should the OV reenter in a hybrid or uncontrolled state, it is probable that the OV would tumble and break up much like any other reentering satellite. The SSC will perform the standard actions required for any TIP object to include determination of the impact point or footprint, piece counts, and OPREP 3 reporting if necessary.

CHECKLIST:

1. b5

2. b5

3 b5

E. OTHER:

JSC/MOCR Outage:

A degradation of JSC computational or command and control capability could be potentially hazardous to Shuttle operations.

SUPPORT: The probability of JSC losing computational capability is extremely remote due to their ability to reconfigure their many redundant backup computers. However, should some unforeseen circumstance occur whereupon JSC loses the capability to support the OV flight, they will transfer computational responsibility to Goddard Space Flight Center (GSFC). As long as JSC has comm capability, they retain command and control; however, should this be lost, Goddard takes command and control of the OV as well. At the point where Goddard assumes computational responsibility, ADCOM

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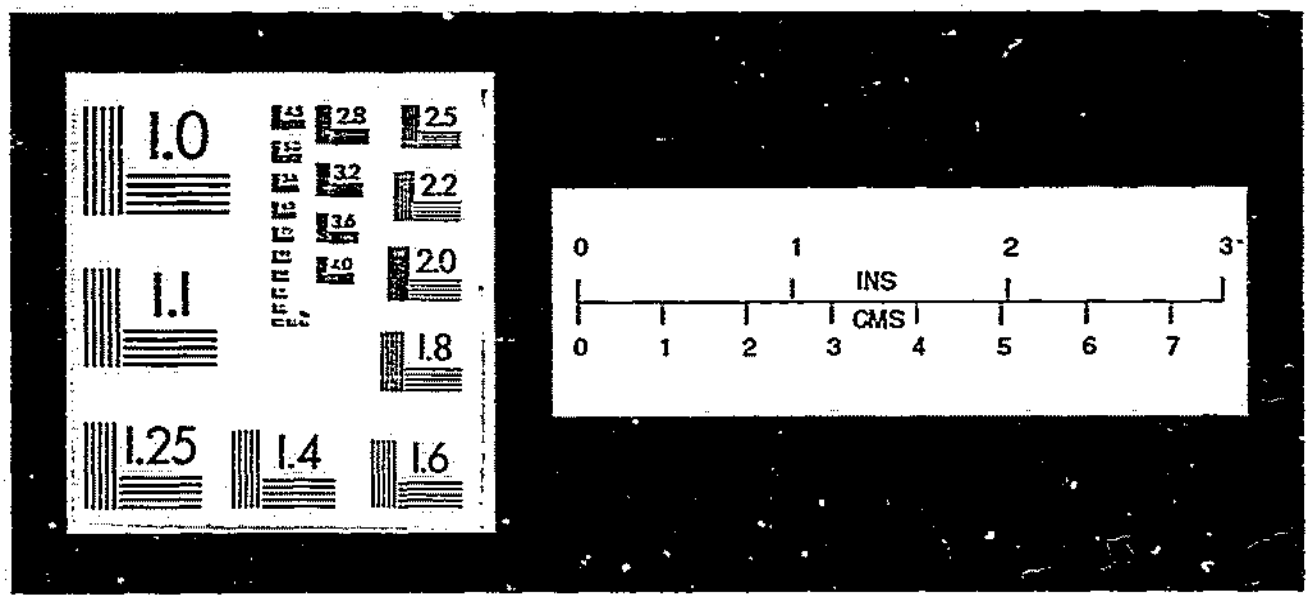

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will go into a dual-support role passing SCC data to both JSC/MOCR and GSFC/MCC. If JSC loses comm as well, ADCOM support will transfer solely to GSFC. The OV would then most likely deorbit at the earliest opportunity.

CHECKLIST:

JSC Loses Computational Capability:

1. b5

2. b5

3. b5

JSC Loses C^3:

1. b5

2. b5

3. b5

DoD Directive to Restrict Tracking of CV:

A possibility exists that NASA may request, through the appropriate DoD channels, that ADCOM be directed to restrict tracking of the OV during all or a portion of the OFT-1 mission.

SUPPORT: Should ADCOM be directed by DoD to restrict tracking of the OV during all or a portion of the OFT-2 mission, then ADCOM sensors will be notified in accordance with the methods listed below. Note: Should this contingency arise, all planned support will continue within the constraints of restricted tracking.

CHECKLIST:

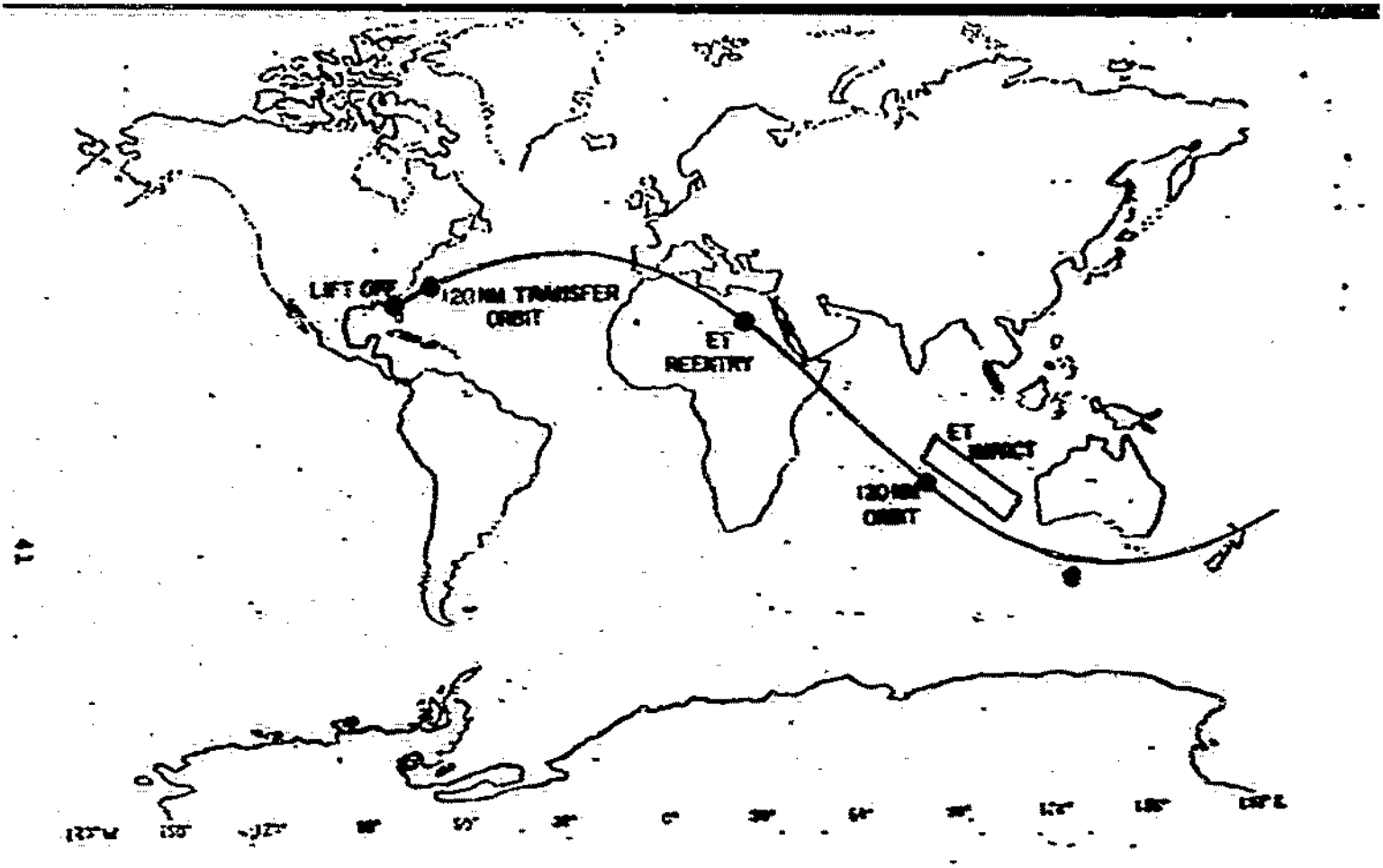
1. b5

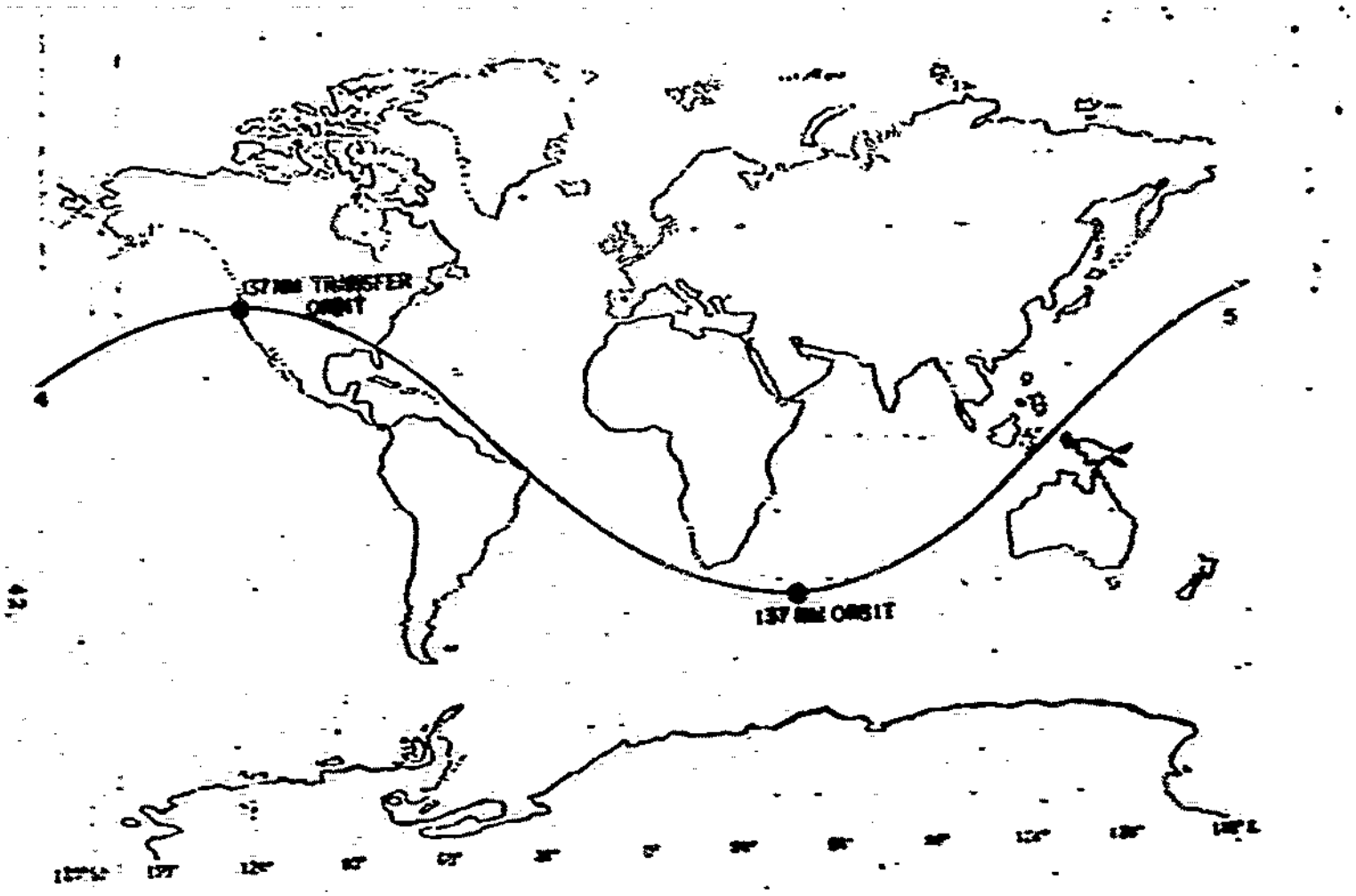
2. b5

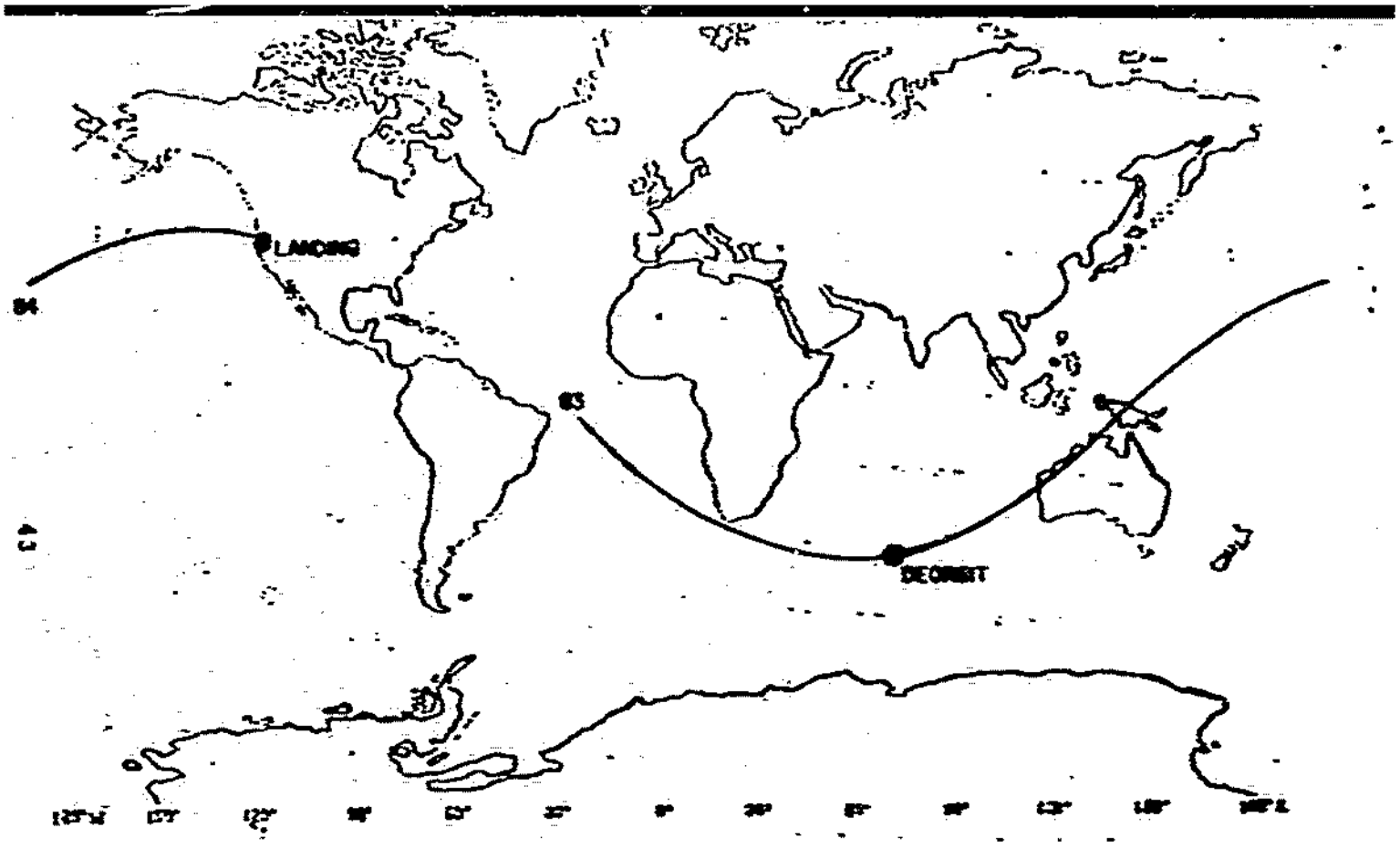
3. b5

APPENDIX 1

OPT - 2 GROUND TRACES


LIFT OFF
120 NM TRANSFER ORBIT
ET REENTRY
ET IMPACT
120 NM ORBIT


137 NM TRANSFER ORBIT
137 NM ORBIT


LANDING
DEORBIT

APPENDIX 2

SPECIAL SUPPORT CRIT

APPENDIX 2

SPECIAL SUPPORT CRITERIA

APPENDIX 2 TO CINCAD IMPLEMENTATION PLAN 3410-81

SPECIAL SUPPORT CRITERIA

A. COMPUTATION OF MISS BETWEEN ORBITS (COMBO):

Cases*

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D. CONFERENCES:

1. Launch Correlation Unit (LCU):

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2. Flight Termination Conference (FTC):

The FTC is a new concept among conferences because the U.S. has never had an orbiting vehicle or satellite capable of controlled reentry. For the Space Shuttle, the SSC will task XNJ to scan the D/O vector and pass where the OV is in relation to it. Beale's L&Is will give an approximation of where the OV would impact if uncontrollable; however, the OV is a lifting body and not in an exact ballistic trajectory, so this data must be analyzed with these points in consideration.

C. TIP:

Project TIP will be implemented to support prediction of where the ET will impact after separation from the OV. This will become especially important if the ET attains an extended ballistic trajectory or a fractional or multiple orbit as a result of an overburn/overspeed condition.

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Therefore, the impact point must be analyzed with this point in consideration. TIP will also be run for any stable OV orbit.

APPENDIX 3

AGENCY/PERSONNEL DIRECTORY

APPENDIX 3 TO CINCAD OPLAN 3410-81 IMPLEMENTATION PLAN

AGENCY/PERSONNEL DIRECTORY

The following will be disseminated only to those agencies and personnel whose official duties specifically require knowledge of this information. Strict compliance to the above is mandatory.

A. TELEPHONE NUMBERS

Agency	Duty
A/J-3Y	NCMC x3004
A/J-3YYA	NCMC x3510
A/J-3YYD	NCMC x3510
ADCOM Public Affairs	635-8911 x4696
FDO (NASA)	Contact A/SSC for restricted number
TRACK (NASA)	Contact A/SSC for restricted number
Comm Control (NASA)	Contact A/SSC for restricted number

B. MESSAGE ADDRESSES

$ NAS to route data through GSFC to JSC

$ JOT to pass data to JSC/MOCR

APPENDIX 4

DISTRIBUTION

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